



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,641	11/09/2005	Elena Bencini	272909US0XPCT	3733
22850	7590	02/23/2011	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			SINGH, PREM C	
			ART UNIT	PAPER NUMBER
			1771	
			NOTIFICATION DATE	DELIVERY MODE
			02/23/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No. 10/538,641	Applicant(s) BENCINI ET AL.	
	Examiner PREM C. SINGH	Art Unit 1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 February 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8,9,12,14-19,21-28,32-37 and 39-51 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8,9,12,14-19,21-28,32-37 and 39-51 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 02/07/2011 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-6, 8, 9, 12, 14-19, 21-28, 32-37 and 40-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Girotti et al (EP 0 847 802 A1) ("Girotti") in view of Grootjans et al (US Patent 5,750,814) ("Grootjans") and Ward et al (US Patent 4,185,040) ("Ward").

4. With respect to claims 1, 12 and 42, Girotti discloses a catalyst composition comprising a crystalline zeolite and an inorganic ligand selected from silica, alumina or natural clays or combinations of these (See page 4, lines 1-22). Girotti further discloses that extra zeolite porosity obtained by adding the mesoporosity and macroporosity fractions present in the catalyst composition itself, which is such that a fraction of at least 25% is composed of pores with a radius higher than 100 Å, and is characterized by a total volume of extra zeolitic pores greater than or equal to 0.80 ml/g (See page 4, lines 8-10). Girotti also discloses using alumina in the bohemite form (See page 8, lines 30-31, 46-47).

Although Girotti uses beta zeolite due to "best results in terms of activity in the alkylation of aromatics" (See page 3, lines 18-19), Girotti also discloses that zeolite Y

has been widely used as alkylation/transalkylation catalyst by different inventors (See page 2, lines 18-24; page 3, lines 2-4, 19-20).

Grootjans discloses an alkylation process similar to Girotti using similar feedstocks, catalyst and operating conditions (See abstract; Examples 1 and 2). Grootjans also discloses use of zeolite Y and zeolite beta on a refractory oxide binder including gamma alumina (See column 4, lines 50-54; column 5, lines 37-39; column 6, lines 49-52). This clearly indicates that zeolite Y and zeolite beta are functionally similar for the process. This also indicates that any form of alumina, including gamma alumina, is equally effective as a binder.

With Grootjan's disclosure showing zeolite Y and zeolite beta to be functionally similar for alkylation/transalkylation process, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention and use zeolite Y on gamma alumina binder because nothing unexpected is evidenced by using zeolite Y in place of zeolite beta. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Girotti invention does not specifically disclose $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio for zeolite Y.

Girotti invention does not appear to specifically disclose $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio for zeolite Y.

Ward discloses a process similar to Girotti for alkylation of aromatic hydrocarbons using a zeolite Y catalyst on a mineral oxide binder, including alumina (See abstract; column 3, lines 21-48). Ward also discloses that the active zeolites employed herein are now well known in the art consisting of $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio between about 2 and 80, preferably about 4 to 12 (See column 3, lines 21-24). Ward

Art Unit: 1771

further discloses that the catalyst is highly active and selective and has high resistance to deactivation (See abstract).

In view of Ward's disclosure, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Girotti invention and use a zeolite Y with $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio as disclosed by Ward for a catalyst with high activity, selectivity and resistance to deactivation.

5. With respect to claims 2 and 41, Girotti discloses crushing strength along the diameter as 7 to 19 Kg/cm (See page 12, Table 1, last line).

6. With respect to claims 3-6, Girotti invention does not specifically disclose apparent density and the particle diameter of the catalyst composition. However the invention does disclose use of the catalyst composition in the form of tablets, bars, cylinders and pellets (See page 5, lines 39-41). Apparent density can easily be determined by calculating the mass of the catalyst and the volume occupied by the catalyst. It is expected that one skilled in the art will use an apparent density in a range, including as claimed, for proper catalytic process. It would have been obvious to one skilled in the art at the time the invention was made to specify the particle diameter to determine the amount of the catalyst required for the catalytic process.

7. With respect to claim 8, Girotti discloses that zeolite is in acidic form (See page 4, lines 39-40).

8. With respect to claim 9, Girotti discloses ligand (binder) content (w/w%) to be 50, i.e., zeolite to binder (ligand) ratio is 1:1 (See page 12, Table 1).

9. With respect to claims 14 and 15, Girotti invention discloses a process for preparing the catalyst of claim 1 as follows:

(a) Preparing a homogeneous mixture comprising beta zeolite in acidic form and an inorganic ligand (bohemite) (See page 5, lines 8-11; page 8, lines 31-32);

(b) Adding a mixture of acid and demineralized water;

(c) Extrusion;

(d) Drying;

(e) Calcination

(See page 15, Figure 1; Example 4, page 8).

Girotti is using zeolite beta, but it would have been obvious to use zeolite Y, as discussed under claim 1.

Girotti does not specifically disclose the details of mechanical mixing in step (a), but does disclose mixing by stirring until complete dissolution (See page 7, lines 35-37). This indicates that one skilled in the art will use a mixer running at a speed in a range, including as claimed, for an effective mixing of components.

Girotti does not specifically disclose the acid strength, but discloses the ratio of acid (peptizing agent) to ligand (binder) to be from 0.028 to 0.121 (w/w). Since the combined weight of acid and ligand should be the total weight of the mixture, it would

Art Unit: 1771

have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention and specify the ratio of acid to the total weight of mixture in step (a).

Girotti discloses aging and drying at a temperature ranging from room temperature to 200°C (See page 13, lines 37-38).

Girotti discloses calcination at a temperature ranging from 400-600°C (See page 13, lines 35-36).

Although Girotti does not specifically disclose drying time and calcinations time, it would have been obvious to one skilled in the art at the time the invention was made to use an optimum time in a range, including as claimed, for proper drying and calcination, respectively.

10. With respect to claims 16 and 17, Girotti invention discloses using acetic acid (See page 12, Table 1).

11. With respect to claim 18, Girotti invention discloses a process for transalkylation of aromatic hydrocarbons comprising putting an aromatic hydrocarbon in contact with a polyalkylated aromatic hydrocarbon in the presence of the catalyst of claim 1, operating so that the reaction takes place at least partially in liquid phase (See claim 22, page 14, lines 14-17).

Art Unit: 1771

12. With respect to claim 19, Girotti discloses that the zeolite is selected from zeolite Y, beta, and ZSM-12 (See page 3, lines 18-20) and the zeolite is in acidic form (See page 4, lines 39-40).

13. With respect to claim 21, Girotti invention discloses temperature ranging from 150 to 300°C, pressure ranging from 20 to 45 atm, and a WHSV ranging from 0.1 to 10 h⁻¹ (See claim 24, page 14, lines 22-23).

14. With respect to claims 22 and 23, Girotti invention discloses molar ratio between aromatic hydrocarbon and polyalkylaromatic hydrocarbon is between 1 and 30 (See claim 25, page 14, lines 25-26).

15. With respect to claim 24, Girotti invention discloses that the aromatic hydrocarbon is benzene (See claim 26, page 14, line 28).

16. With respect to claim 25, Girotti invention discloses that polyalkylated aromatic hydrocarbon is selected from diethyl benzene and diisopropyl benzene (See claim 27, page 14, lines 30-31).

17. With respect to claim 26, Girotti invention discloses that the aromatic hydrocarbon is preferably benzene. The polyalkylated aromatic hydrocarbon is

Art Unit: 1771

preferably selected from diethyl benzene and possibly triethyl benzene (See page 6, lines 45-48).

18. With respect to claims 27 and 43-51, Giroti discloses a process for preparing mono-alkylated aromatic hydrocarbons comprising: (See page 7, lines 25-31).

1) contacting an aromatic hydrocarbon and a C₂-C₄ olefin, including ethylene and propylene (See page 14, line 1), with each other, in the presence of an acidic catalyst (zeolite beta), under such alkylation conditions that the reaction takes place at least partially in liquid phase; (See page 7, lines 25-31).

2) separating the product obtained into a fraction containing an aromatic hydrocarbon, a fraction containing a monoalkylated aromatic hydrocarbon and a fraction containing polyalkylated aromatic hydrocarbons; (See page 7, lines 25-31).

3) contacting the fraction containing the polyalkylated aromatic hydrocarbons with an aromatic hydrocarbon, in the presence of the catalyst of the present invention (see under claim 1), under such transalkylation conditions that the reaction takes place at least partially in liquid phase. (See page 7, lines 25-31).

As discussed under claim 1, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention and use zeolite Y on gamma alumina binder as disclosed by Grootjans because zeolite Y and zeolite beta have been shown to be functionally similar for alkylation/transalkylation process. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

Art Unit: 1771

19. With respect to claim 28, Girotti discloses that the zeolite is selected from zeolite Y, beta, and ZSM-12 (See page 3, lines 18-20) and that zeolite is in acidic form (See page 4, lines 39-40).

20. With respect to claims 32-34, Girotti invention discloses that olefin in step (a) is ethylene and propylene and aromatic hydrocarbon is benzene (See page 14, lines 1-3; page 13, line 57).

21. With respect to claim 35, Girotti invention discloses that step (a) uses zeolite beta (See page 3, lines 18-20), olefin is ethylene (See page 14, line 3), and aromatic hydrocarbon is benzene (See page 13, line 57).

22. With respect to claim 36, Girotti invention discloses that the polyalkylated aromatic hydrocarbon is preferably selected from diethylbenzene (See page 6, lines 46-47).

23. Claim 37 has all the limitations of claim 27 and discussed before. Additionally, the claim requires in step (a), benzene as hydrocarbon and ethylene as olefin; in step (b) the claim requires fractions containing benzene, ethyl benzene, diethyl benzene, and heavy hydrocarbons with boiling point higher than 260°C; and in step (c) the third fraction putting in contact with benzene.

Girotti discloses steps (a) through (c) on page 6 (lines 45-50). Example 9 (See page 9, lines 44-58; page 10, lines 1-3) shows details of step (a) and (b) and Example 13 (See page 10, lines 54-56; page 11, lines 1-19) shows details of Step (c).

Although Girotti invention does not specifically disclose heavy hydrocarbons with boiling point higher than 260°C, the invention does disclose the analysis of alkylated liquid product by gas chromatography (See page 9, line 54). Since gas chromatography separates different products, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention, and specify the boiling point of heavy hydrocarbons separated by chromatography for their proper characterization.

24. With respect to claim 40, Girotti invention discloses using gas chromatography to analyze alkylated products comprising diethyl-, triethyl-, diisopropyl-, and triisopropyl benzene (See page 6, lines 45-50). The invention also discloses 19.8 wt% heavy products (See page 11, lines 1-14).

Girotti's silence on butyl benzene in the product may read zero or negligible amount, and it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention, and specify the butyl benzene content which might be negligible. It is to be noted that zero butyl benzene in Girotti invention reads on the Applicant's claim of not higher than 2%.

25. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Girotti et al (EP 0 847 802 A1) ("Girotti") in view of Grootjans et al (US Patent 5,750,814)

Art Unit: 1771

("Grootjans") and Ward et al (US Patent 4,185,040) ("Ward") and further in view of Applegath et al (US Patent 3,848,012) ("Applegath").

26. With respect to claim 39, Girotti does not disclose using flux oil in step (c).

Applegath discloses a process similar to Girotti for alkylation of aromatics (See abstract). Applegath also discloses that the heavy products obtained at the bottom of the distillation column along with polyalkylated products, comprise flux oil (See column 5, lines 66-68; Table 1).

In view of Applegath's teaching, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention, and specify the flux oil content in the bottoms to characterize the product quality obtained in the alkylation process.

Response to Arguments

27. Applicant's Declaration under 37 C. F. R §1.132 filed 02/07/2011 has been considered. The arguments are based on the results disclosed in the Declaration.

28. In the arguments on page 11, the Applicant argues that:

The Declaration compares the performance characteristics of a catalytic composition meeting the requirements of the present claims with catalytic compositions that have a $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio that is outside the 10-20 range

presently claimed, i.e., $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratios of 30 and 5.2. The inventive catalyst composition provides substantially improved polyethylbenzenes conversion and improved lifetime in comparison with the comparative catalytic compositions that do not meet the $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio range of the present claims. Nothing in the Grootjans, Ward or Girotti references suggests that improved productivity and catalyst lifetime can be obtained by using a zeolite Y having a $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio of 10-20 in the manner recited in the present claims.

In response, it is the examiner's position that Ward discloses that the active zeolites employed herein are now well known in the art consisting of $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio between about 2 and 80, preferably about 4 to 12 (See column 3, lines 21-24). Ward further discloses that the catalyst is highly active and selective and has high resistance to deactivation (See abstract). It is to be noted that the Applicant achieves best performance with $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio of 12, and the preferred ratio disclosed by Ward overlaps the Applicant's result.

29. In the arguments on page 12, the Applicant argues that:

The Declaration also compares the performance characteristics of a catalytic composition meeting the requirements of the present claims with catalytic compositions in which at least 30% of the pore volume does not consist of pores with a diameter greater than 100 nanometers. The inventive catalyst composition provides substantially improved polyethylbenzenes conversion in comparison

Art Unit: 1771

with the comparative catalytic compositions that does not have at least 30% of the pore volume consisting of pores with a diameter greater than 100 nanometers. Nothing in the Grootjans, Ward or Girotti references suggests that improved productivity and catalyst lifetime can be obtained by using a zeolite Y having a pore volume fraction of greater than 30% having a diameter of 100 nm.

In response, it is the examiner's position that Girotti discloses that the catalyst has an extra zeolite porosity obtained by adding the mesoporosity and macroporosity fractions present in the catalyst composition itself, which is such that a fraction of at least 25% is composed of pores with a radius higher than 100 Å, and is characterized by a total volume of extra zeolitic pores greater than or equal to 0.80 ml/g (See page 4, lines 8-10). Also, Ward discloses, ".....to provide a porous matrix comprising macropores in the 300-1000 Å diameter range" (Column 3, lines 51-53). Thus, Girotti and Ward both disclose a catalyst which is expected to have a pore volume fraction of greater than 30% having a diameter 100 nm as claimed. Also, the combined inventions of Girotti and Ward teach a catalyst which is expected to have improved productivity and lifetime as argued.

30. In conclusion, the claimed invention is *prima facie* obvious over Girotti in view of Grootjans, Ward and Applegath.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PS 021611

/PREM C SINGH/
Primary Examiner, Art Unit 1771